XR TIME SYNCHORNIZATION

14000 SERIES TRANSMITTER - EXTERNAL ANTENNA

INSTALLATION & USER GUIDE

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REGULATORY COMPLIANCE

Federal Communications Commission (FCC) / Industry Canada (IC)

License Requirements

- Operation of the Transmitter requires a FCC/IC operating license, which must be obtained prior to operation.
- FCC licenses must be renewed every 10 years and the IC licenses must be renewed annually.
- As a service, Primex Wireless will file the license application if the end-user desires it. An end-user that does not want Primex Wireless to file for the original site license will be required to complete a waiver form, file the required application, and receive a valid license from the FCC/IC prior to use.If you have any questions or need any assistance, please contact Primex Wireless at 1-800-537-0464.
- Primex Wireless requires a copy of the licenses in order to complete the factory presets.

Product Compliance

- This device complies with Part 90 and Part 15 of the FCC rules and RSS-210 of Industry Canada.
- Operation of this device is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference, including interference that may cause undesired operation.

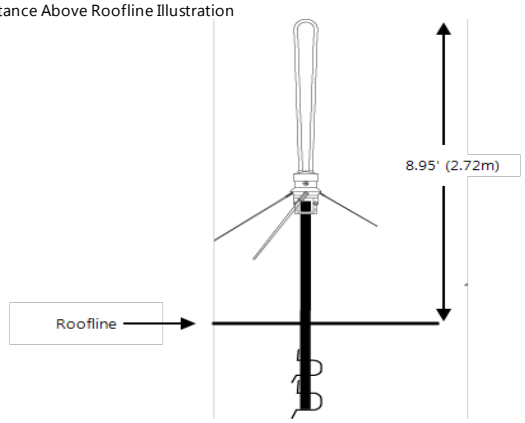
Changes or modifications to any part of the Primex Wireless System components not expressly approved by Primex Wireless could void the user's FCC/IC authority to operate the equipment.

Radio Frequency (RF) Exposure

To comply with FCC OET65 and Industry Canada RF exposure requirements, the antenna is only to be used or installed in locations where the following antenna separation guidelines exist when the transmitter is in operation. Distance above roofline is for direct line of sight only, as illustrated in Figure 1.

Distance Above Roofline: 8.95' (2.72m)

Figure 1: Distance Above Roofline Illustration



IMPORTANT SAFETY INSTRUCTIONS

READ ALL INSTRUCTIONS BEFORE INSTALLATION, OPERATION, OR MAINTENANCE OF PRODUCT.

Some of the following information may not apply to your particular product model; however, as with any electronic product, precautions should be observed during installation, operation, and maintenance.

- Never operate the transmitter without the antenna being properly connected to the transmitter. Operating the transmitter without an antenna can lead to permanent damage of the transmitter and poses a safety risk.
- Do not touch any of the antennas while broadcasting.
- Standard acceptance procedures must be followed prior to operating this equipment in the proximity of life support systems.
- Do not operate the transmitter outdoors, in wet areas were there is standing water, or in areas where there is condensation or the risk of condensation. Use in any of these environments will damage the transmitter and void the warranty.
- Do not open the transmitter to alter the internal elements in any way. This will void the warranty and could lead to unsafe conditions, malfunction, and violations of FCC/IC regulations.
- Do not use a metal ladder during installation of the external antenna.
- During antenna installation, be sure to wear shoes with rubber soles and heals and wear protective clothing with long sleeves and rubber gloves.
- Do not install the antenna on a wet or windy day when lighting or thunder is in the area or near power lines. Power lines, telephone lines, and guy wires look the same. As a precaution please assume any wire can electrocute you.

The installation, maintenance, or removal of an antenna requires qualified, experienced personnel. The installation instructions are written for such installation personnel.

Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and condition of equipment.

Primex Wireless disclaims any liability or responsibility for the results of improper or unsafe installation practices.

XR Series Time Synchronization System Overview

Architecture

The XR Time Synchronization System has been designed with customization in mind. It provides a scalable solution that offers time synchronization services for a variety of devices and components. The system ranges from a a single transmitter, GPS Receiver, and a handful of clocks in a single building, to a campus wide deployment.

Precision Timing

The Global Positioning System (GPS) Receiver draws time information from the U.S. Government Satellites. The GPS Receiver then sends the time to the transmitter.

Synchronization

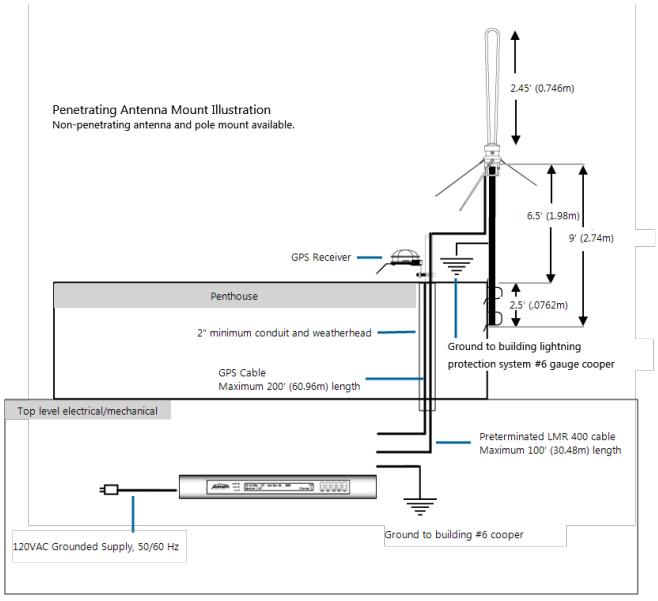
Once the transmitter has received its time, from either a GPS Receiver or another transmitter, it sets its internal clock. It then transmits time information or schedules via a wireless radio signal to the wireless clocks, bells, and other devices in the system. As a result, the system clocks, bells, and other devices are precisely synchronized to each other and all time, schedules, and events are kept current.

- **Time Source:** The transmitter has its time synchronized by a GPS Receiver and then broadcasts that time and event schedules to clocks and other devices. The transmitter operates on channels with 20kHz bandwidths and 72MHz frequency and is preset to one of the channels licensed by the FCC/IC to minimize interference on these frequencies and channels.
- **Transmit Schedule**: The transmitter transmits its synchronized time to the system clocks and devices from the 39th to the 6th minute of the next hour and changes to a standby mode during the 7th to the 38th minute of the hour (standard broadcast schedule). During initial power-up, the transmitter broadcasts for 8 consecutive hours. After the 8 hour power-up period, the transmitter reverts to the standard broadcast schedule.

Typical System Setup

The illustration below represents a typical system setup.

Figure 2: Transmitter - External Antenna Typical System Setup



System Specifications

System Components

- XR 14000 Series Transmitter - External Antenna
    - 100' (30.48m) LMR 400 coaxial cable
    - Gelwrap splice enclosure
    - Power supply and cable extension
    - Grounding clamp
    - 6 AWG stranded wire
    - Terminal lug
- Ground Plane Omnidirectional Antenna

Optional Equipment

- GPS Receiver
- GPS Extension Cable
- GPS Receiver Mounting Kit
- Ground Plane Omnidirectional Antenna Pole Mounting Kit
- Ground Plane Omnidirectional Penetrating Antenna Kit
- Ground Plane Omnidirectional Non-Penetrating Antenna Kit
- Satellite Transmitter

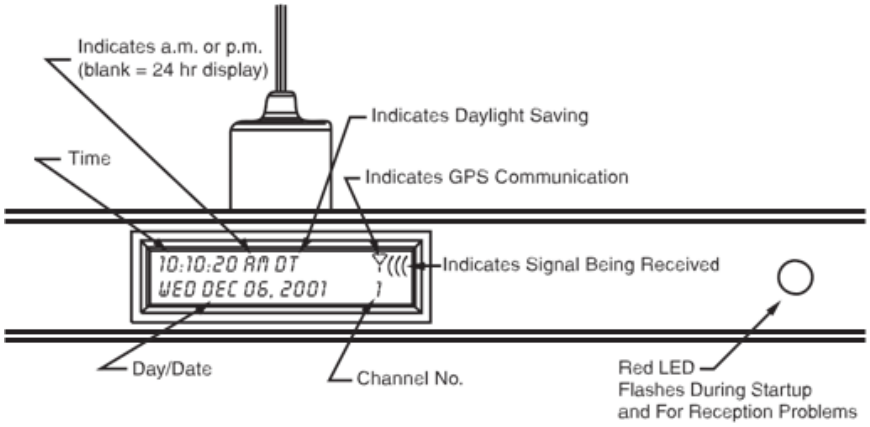
Transmitter Specifications

- 1 Watt maximum transmission (at transmitter)
- 72MHz frequency range
- 16 channels available (pre-programmed prior to shipping)
- Daylight Saving Time bypass switch
- Time zone adjustment switch (pre-programmed on 14000-E prior to shipping)
- LCD display for time, date, and signal verification
- Dimensions: 16.0"L x 12.0"W x 1.9"D (40.6cm x 30.5cm x 4.8cm)
- Power Supply:
    - Input: 120 VAC, 50/60 Hz, 0.4 Amp
    - Output: 9 VDC, 2.0 Amp (6 ft. cord, 1.83m)
- Operating Range: 32°- 158°F (0° - 70°C)

Transmitter Display Specifications

The transmitter has a lighted front display that shows important information.

Figure 3: 14000 Series Transmitter Display



Display Specifications

Table 1: 14000 Transmitter Display Specifications

Component	Description
Time	Displays the precise time received from the GPS Receiver. If AM or PM is on the display, then the 12-hour option is selected. If neither AM nor PM is on the display, then the 24-hour option is selected.
Daylight Saving Time	The letters "DT" (Daylight Saving Time) or "ST" (Standard Time) will be displayed when adjustment for Daylight Saving Time is active. If neither "DT" nor "ST" is displayed, then switch #3 is in the down position and the transmitter will not adjust for Daylight Saving Time.
GPS Communication	The GPS Communication indicator appears when the transmitter is communicating with the GPS Receiver. The parentheses ((indicate the time signal is being received.
Day/Date	Displays the day and date received from the GPS satellite.
Channel Number	Displays the channel number (1-16) the transmitter is set to.
Red LED	The red LED (Light Emitting Diode) is located on the right side of the front panel of the transmitter. The LED flashes on initial setup until a GPS time signal is received or when a severe GPS Receiver signal problem has occurred and no time data has been received from the GPS Receiver in 48 hours. See the Troubleshooting section of this guide for additional information.

GPS Receiver Specifications

The GPS receiver draws time information from the U.S. Government Satellites, providing the system with Coordinated Universal Time (UTC).

- Mounted to rooftop, pole, or window (not a Low-E glass window).
- GPS receiver sends the UTC time to the transmitter via the NMEA 0183 standard protocol.

- Optional GPS extension cable. A specially designed low-resistance cable is available to extend the distance between GPS receiver and transmitter. The maximum total length of the cable cannot exceed 200' (60.96m).

Table 2: GPS Receiver Specifications

Parameter	Specification
Cable	10' (3.05m) cable 50', 100',and 200' (15.24m, 30.48m, and 60.69m) extensions available. The maximum total length of the cable cannot exceed 200' (60.96m).
Dimensions	2.5"W x .75"H (6.35cm x 1.91cm)
Mounting Bracket	3.5"W x 1.4"H x 4.5"D (8.89cm x 3.56cm x 11.43cm) Included for rooftop or window installation.
Weight	0.75 lb. (.34kg)
Operating Range	-32°- 158°F (-30° - 70°C)

INSTALLATION AND CONFIGURATION

Transmitter and GPS Receiver Location

The first step in setting up the transmitter is to determine a suitable location for the transmitter and GPS Receiver. Location is extremely important to ensure the best operation of the system. You must consider the following:

Installation and Configuration Overview

- Review the Installation Location Guidelines and identify the installation location of the system components.
- Inspect system components to verify packaging includes all supplied parts for each system component and verify no damage has occurred during shipping.
- Do not install or attempt to set the system wireless clocks or devices until the system components are installed and configured, the transmitter is powered and its time source is configured, and the transmitter is fully operational.

Summary of Installation

Listed below is a summary of the order in which the system and its components are to be installed and configured.

1. Assemble the ground plane omindirectional antenna .
2. Assemble the antenna mast.
3. Route the antenna LMR 400 coaxial cable
4. Route the GPS cable.
5. Install the GPS receiver.
6. Secure the antenna to mast.
7. Ground the antenna mast.
8. Ground the transmitter.
9. Connect the transmitter time source.
10. Establish the transmitter settings and verify connections.
11. Verify the system is operational.

Installation Location Guidelines

When planning the system installation, Primex Wireless recommends taking into consideration the below installation guidelines.

> **NOTE:** Prior to installation and to assure optimum performance of the system, it is recommended a Primex Wireless Applications Engineer performs a site survey. The site survey includes an analysis and recommendation of the installation location of the system components and ground plan omnidirectional antenna.

Ground Plane Omnidirectional Antenna Installation Location Guidelines

- In the event that metal objects extend above the level of the ground plane, the radiation pattern will be distorted. Radiation through metal objects will be lower than from other directions.
- The antenna cannot be placed on or directly adjacent to walls or metal structures.
- Antenna is required to be a minimum of 15' (4.57m) clear from the radius of other antennas.

Transmitter Installation Location Guidelines

- Transmitter should be located a minimum of 2 to 3 feet above the floor.
- Locate transmitter within 8 feet from a 120 VAC electrical outlet.
- Locate transmitter within 100' (30.48m) of antenna. The maximum cable length allowed between the antenna and transmitter is 100' (30.48m) .
- The transmitted signal from the antenna radiates in a circular and “umbrella” pattern; therefore a central location for the transmitter where the antenna is at maximum allowable height is recommended to ensure best possible coverage.
- In multi-story buildings, installation the transmitter on the top floor will often significantly improve coverage to the lower floors due to the “umbrella” pattern of transmission.

GPS Receiver Installation Location Guidelines

Determine a suitable location for the GPS receiver unit. Location is extremely important to ensure the best operation of the system. You must consider the following:

- GPS receiver unit requires a "clear view of the sky" to receive a GPS signal 24 hours a day.
- Typical mounting locations of the GPS receiver unit include the inside of a window (not a Low-E glass window), to an exterior pole or on a rooftop.
- GPS receiver unit should be kept away from large metal objects.
- GPS receiver unit and cable are mounted above any potential standing water, snow depth, leaves or other obstructions and it protected from weather.
- Maximum total distance of the GPS cable to the transmitter cannot exceed 200' (60.96m).
- If the GPS cable is located outdoors, the use of a gelwrap splice enclosure is strongly recommend.

Tools and Equipment Required

To install the system and its components, you will need the following tools and equipment.

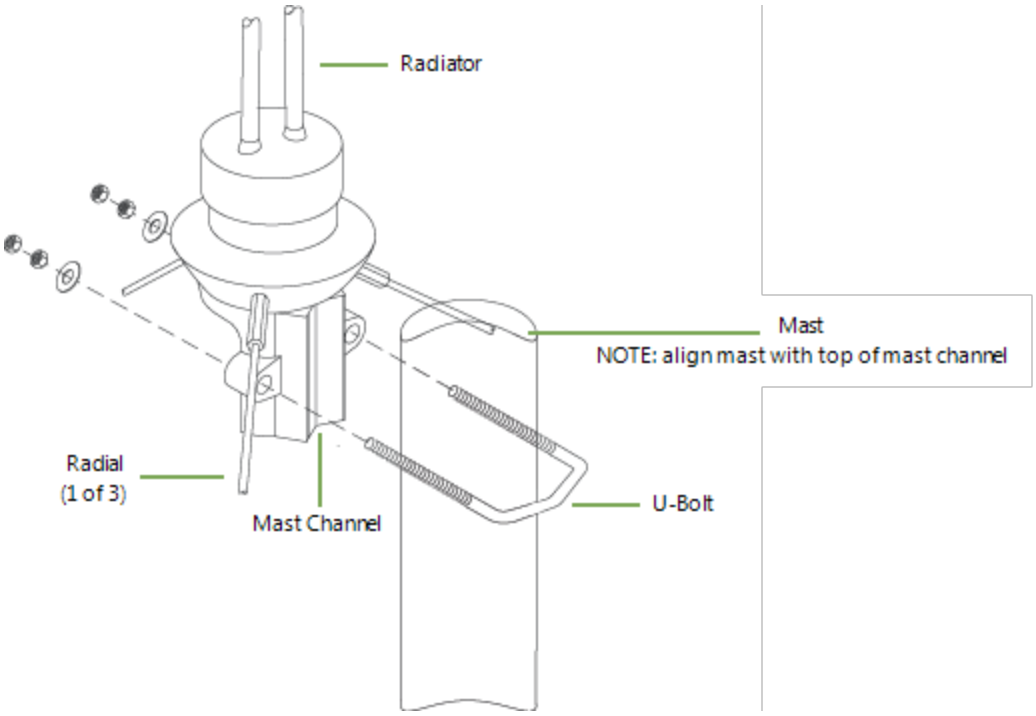
- Hammer drill
- 3/4” concrete drill bit, 18” (45.72cm) long
- Penetrating Mount only: 5/8" concrete drill bit, 18” (45.72cm) long
- 1/2” wrench
- Caulk for concrete
- Phillips and flat head screwdrivers
- 10” (25.4cm) adjustable wrench
- Lineman’s pliers
- Shears/scissors
- Transmitter shelf (recommended)
- Building ground near transmitter
- Ground near transmitting antenna

Assemble Ground Plane Omnidirectional Antenna

Complete the steps below to assemble the antenna.

1. After removing the antenna from the shipping box, inspect all contents to ensure all parts are on hand and no damaged has occurred during shipping.
2. Screw the radials (3) into the base of the antenna.
3. Assemble the U-bolt on the base of the antenna. The Mast is to be aligned with the top of the mast channel.

Figure 4: Antenna Assembly



Assemble Antenna Mast

The Antenna Mast has two sections secured by a hex bolt during shipment. The two sections include a 5′ by 1.25″ (1.52m by 2.54cm) rigid galvanized conduit and a 5′ by 1″ (1.52m by 3.17cm) rigid galvanized conduit.

> **NOTE:** The Non-penetrating mounting kit only includes the 5′ by 1.25″ rigid galvanized conduit section.

Complete the steps below to assemble the antenna mast.

1. Loosen and remove the hex bolt.
2. Remove the 5′ by 1″ rigid galvanized conduit section.
3. Insert the 5′ by 1″ rigid galvanized conduit section into the 5′ by 1.25″ rigid galvanized conduit section in reverse as shipped to attain a combined antenna mast length of 9' (2.74m).
4. Align the sections' fastening holes and secure sections together using the supplied hex bolt and nuts.

Mount the Antenna Mast

> **NOTE:** Mounting the antenna mast may require two people.

There are three available mounting methods. The method used is dependent upon the mounting kit supplied with the system.

- **Non-Penetrating Antenna Kit:** See "Install Non-Penetrating Antenna Kit" for detailed mounting instructions.
- **Penetrating Antenna Kit:** See "Install Penetrating Antenna Kit" for detailed mounting instructions.
- **Antenna Pole Mounting Kit:** See "Install Pole Mount Kit" for detailed mounting instructions.

Install Non-Penetrating Antenna Kit

The Non-Penetrating Antenna Kit is designed for mounting a ground plane omnidirectional antenna when mounting to the side of a structure is not practical.The overall footprint of the frame is 29" X 35 ½" (73.66cm x 88.9cm).

Kit Contents

The kit is supplied with the following parts. If any of these items are missing, please contact Primex Wireless.

Description	Qty
5' by 1.25" (1.52m x 3.17cm) rigid galvanized conduit mast	1
Tripod leg: 27"(2.54cm) each in length	3
34 ¾"(88.26cm) Frame rail (long)	2
28 ¼" (71.75cm) Frame rail (short)	4
Long carriage bolt	1
Short carriage bolt	11
Flat washers	12
Locknuts	12

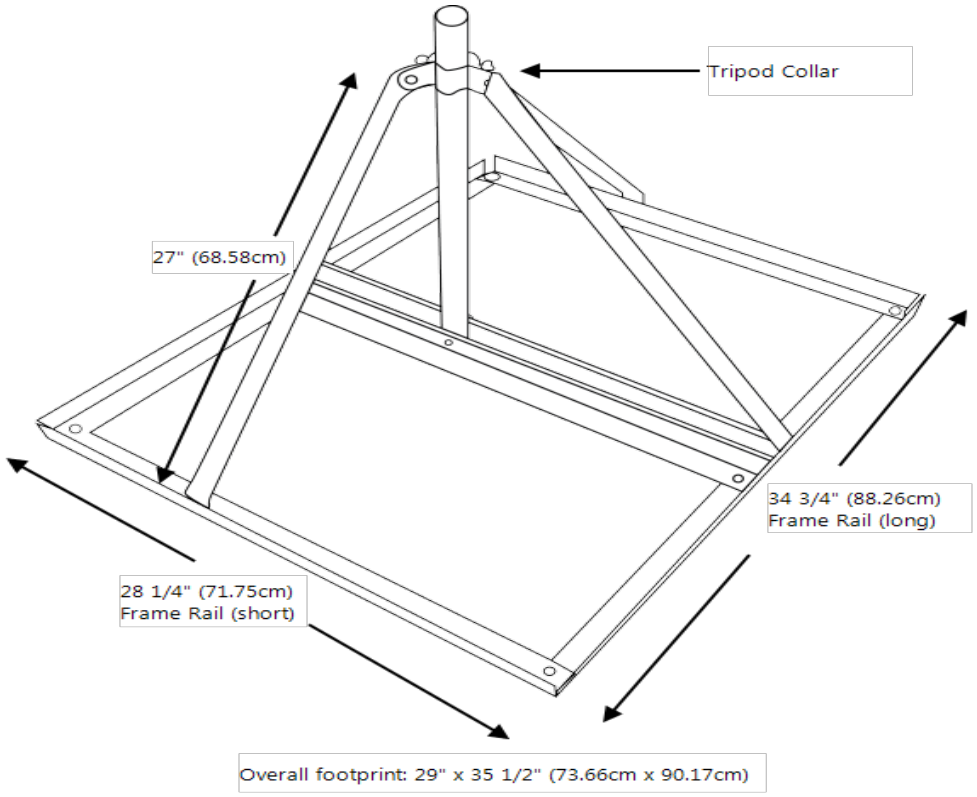
Installing the Antenna Using the Non-Penetrating Kit

Complete the steps below to mount an antenna using a non-penetrating antenna kit. The assembly is illustrated in For additional information, see "Non-Penetrating Mount Illustration" located on page 11.

1. Verify the kit contents.
2. Assemble the outer frame by laying the 2 long frame rails parallel to each, approximately 30" (76.2cm) apart.
3. Insert a short carriage bolt from the bottom at each frame rail end, pointing skyward (4 total).
4. Connect the 2 long frames rails by placing the 2 short frame rails on top of the 4 protruding bolts to form a rectangle. Make sure the square holes in the short tail "sides" are directly opposite each other.
5. Place a washer and nut on each of the 4 bolts and finger tighten.
6. Position the tripod within the 4 sided frame.
7. Secure the 3 tripod legs to the inside of the frame by inserting 3 short bolts, from the inside and placing the washer and nut on the outside of the frame.
8. Drop the bottom of the mast (end with hole) through the top of the tripod collar.
9. Place the remaining 2 short rails parallel to each other, separated by the bottom of the mast.
10. Align the hole at the bottom of the mast, with the 2 square holes in the short frame rail sides.
11. Insert the long bolt and connect the frame rails to the mast.
12. From the underside of the frame, insert the 4 remaining short bolts upward and connect the inner short tails to the frame.

13. Tighten all nuts to secure.
14. Next, route the antenna cable. For additional information, see "Route Antenna LMR 400 Coaxial Cable" located on page 14.

Figure 5: Non-Penetrating Mount Illustration



Install Penetrating Antenna Kit

The Penetrating Antenna Kit contains the materials required to mount the antenna to a wooden pole or masonry wall. A 5/8" (1.58cm) diameter mounting hole is required and the maximum diameter of the pole or wall thickness is 14" (35.56cm).

Kit Contents

The kit is supplied with the following parts. If any of these items are missing, please contact Primex Wireless.

Description	Qty
5′ by 1.25″ rigid galvanized conduit section	1
5′ by 1″ rigid galvanized conduit insert	1
Antenna mounting clamp	2
1/2" hex head bolt	2
1/2" bolt washer	2
1/2" lock washer	2
1/2" hex nut	2

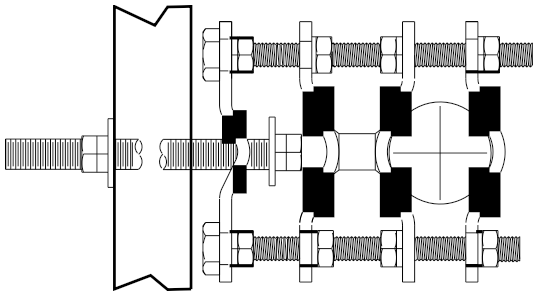
Mounting Antenna Using Penetrating Antenna Kit

Complete the steps below to mount the antenna using a penetrating antenna kit.

> **NOTE:** The recommended diameter of the pole or the wall thickness should not exceed 14" (35.56cm).

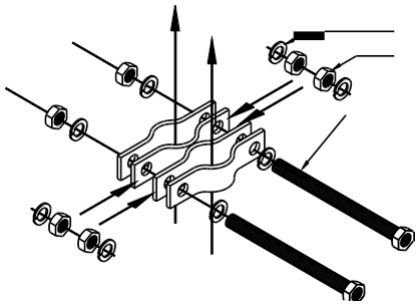
1. Verify the kit contents.
2. Assemble both clamps, as shown in Figure 6, tightening the hex nuts to a torque of approximately 45ft-lbs.

Figure 6: Wall Mount



3. Remove the nut and washer from 14" threaded rod.
4. Drill a 5/8" hole through the top of an exterior wall.
5. Insert the 14" threaded rod through the hole in the wall. If the thickness of the wall is greater then 10", a longer rod may be required. Different lengths of rod are available at hardware stores. If a longer threaded rod is needed, please use a 5/8"-11 threads per inch rod.
6. Place the nut and metal plate over the rod.
7. Tighten the square nuts to an approximate torque of approximately 55 ft-lbs.
8. Drill a second 5/8" (1.59cm) hole 2.5' (0.76m) directly below the first hole.
9. Ensure both clamps are vertically aligned, as shown in Figure 7.
10. Repeat Steps 4 through 6.
11. Connect the LMR 400 cable to the antenna. Be sure the connection is tight.
12. Insert the mast into the clamps.
13. Tighten both clamps evenly and securely.
14. Next, route the antenna cable. For additional information, see "Route Antenna LMR 400 Coaxial Cable" located on page 14.

Figure 7: Aligning Clamps



Install Pole Mount Kit

The Pole Mount kit is designed for the purpose of mounting the ground plane ominidirectional antenna to round or angled tower legs. The clamps can be used on round tower legs that measure for 1.25" to 3.25" (3.17cm to 8.25cm) OD or on angled tower legs that measure up to 3" (7.62cm) on a side.

The center section of each clamp is welded to proved mechanical stability and all parts are hot-depped galvanized steel.

Kit Contents

The kit is supplied with the following parts. If any of these items are missing, please contact Primex Wireless.

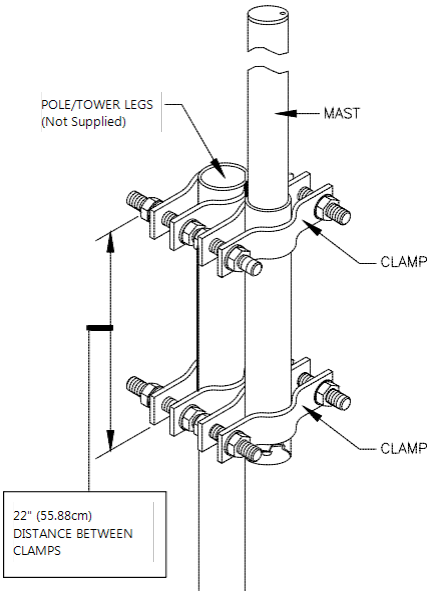
Description	Qty
5' by 1.25" rigid galvanized conduit section	1
5' by 1" rigid galvanized conduit section	1
X style clamp	2
U-clamp	4
1/2" all thread bolt	4
1/2" lock washer	16
1/2" hex nut	16

Mounting Antenna Using Pole Mount Antenna Kit

Complete the steps below to mount the antenna using the pole mount antenna kit.

1. Verify the kit contents.
2. Assemble both clamps, as shown in Figure 8, tightening the hex nuts to an approximate torque of approximately 45 ft-lbs.
3. Tighten half of one clamp two feet below the top of the pole. Use a 3/4" wrench to do this and be sure to tighten the clamps both evenly and securely.
4. Tighten half of the other clamp, using a 3/4" wrench, a few inches below the top of the pole. Be sure to tighten the clamps both evenly and securely.
5. Connect the LMR 400 cable to the antenna. Be sure the connection is tight.
6. Insert the mast into the clamps. The bottom of the mast should be a minimum of 2" below the bottom clamp.
7. Tighten all nuts on both clamps using a 3/4" wrench. The final assembly is to resemble Figure 8.
8. Next, route the antenna cable. For additional information, see "Route Antenna LMR 400 Coaxial Cable" located on page 14.

Figure 8: Pole Mount



Route Antenna LMR 400 Coaxial Cable

Complete the below steps to route the LMR 400 coaxial cable from the transmitter to the antenna.

1. Drill a 1" (2.54cm) hole through an exterior wall of the building that is in close proximity to the antenna installation location.
2. Rollout the LMR 400 cable to prevent kinks from developing during routing.
3. Route the LMR 400 cable female connector from the transmitter installation area to the outside installation location of the antenna, leaving enough cable for (2) 1' (0.30m) diameter coils at the base of the antenna mast.
4. Form and secure two 1' diameter (305mm) loops in the LMR 400 cable at the base of the mast for lightning protection.
5. Connect the LMR 400 cable to the antenna.

Route GPS Cable

Complete the below steps to route and connect the GPS cable to the transmitter.

1. From the outside of the building, route the GPS cable through thea 5/8" 3/4" drilled hole into the building.

Install GPS Receiver

Mounting Kit Contents

The GPS Receiver mounting kit is supplied with the following parts. If any of these items are missing, contact Primex Wireless.

Part	Quantity
Mounting bracket	1
LVC and connector	1
M3 x 0.5 x 6mm pan head screws	2
#6 x 3/8 sheet metal screw	3
Suction cups	3
U-bolt with nuts for mounting on 1" (2.54cm) pole	1

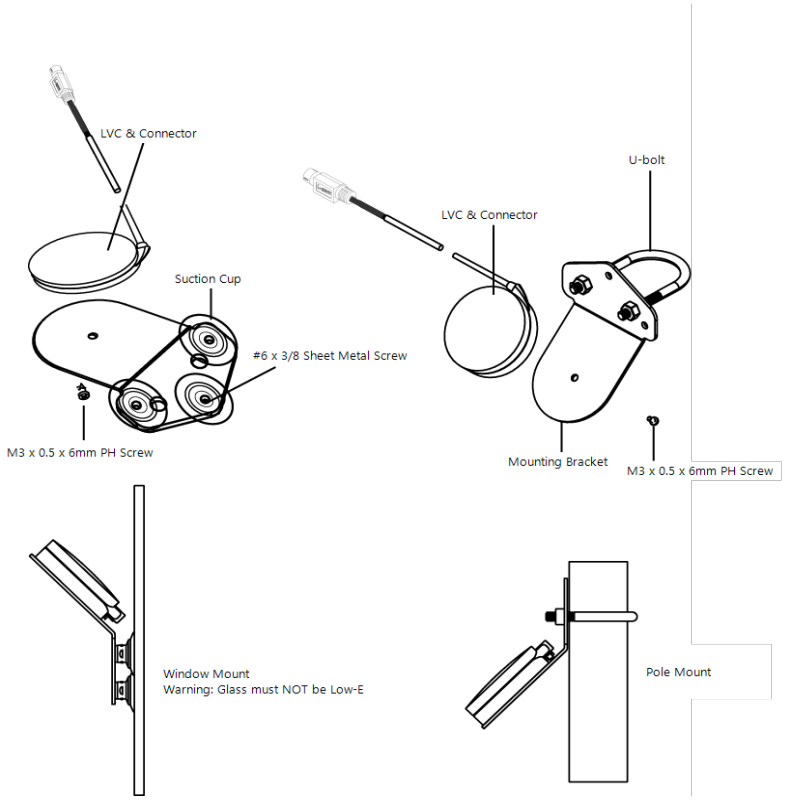
Mounting the GPS Receiver

If the system will use GPS as its time source, complete the following installation steps.

1. Verify the kit contents.
2. Verify the installation location meets the installation guidelines.
3. Assemble and mount the GPS receiver unit to an inside of a window (not Low-E glass), an outside pole, or rooftop. The mounting location is required to have a clear view of the sky.

> **CAUTION:** Be sure to follow local building code requirements when attaching the GPS unit to the inside of a window. Clean the windowpane before using the suction cups for attachment.

Figure 9: GPS Receiver Installation Components and Illustration



Secure Antenna to Mast

Complete the steps below to secure the antenna to the mast.

1. Attach and fasten the antenna channel side base to the top of the 1" rigid galvanized conduit section.
2. Use a 1/2" wrench to tighten the nuts on both of the U-bolts, both evenly and securely. Tighten the second nut to the first nut, to ensure it is secure.

Connect Cables

Complete the steps below to connect the GPS and LMR 400 cable to the transmitter.

1. Connect the GPS cable to transmitter "GPS IN" port, located on the rear of the transmitter.
2. Connect the LMR 400 cable to the transmitter "External Antenna" port, located on the rear of the transmitter.

Ground the Antenna Mast

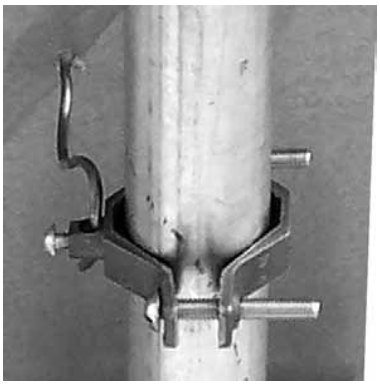
Complete the steps below to ground the antenna mast. The National Electrical Code (NEC) requires that every antenna installation be grounded. Also, many areas have local antenna-grounding codes. Be sure that you are familiar with the grounding and other antenna regulations in your area.

1. Secure the ground clamp (supplied) around the antenna mast.
2. Insert and tighten the #6 gauge wire (supplied) in the ground clamp. The final assembly should resemble Figure 10.

> **NOTE:** Cut the 50' wire off at the necessary length. The remainder of the wire will be used to ground the transmitter.

3. Connect the other end of the #6 gauge wire to a verified building/earth ground.

Figure 10: Ground Clamp



Ground the Transmitter

Complete the steps below to ground the transmitter.

1. Connect and tighten the terminal ground lug (supplied) on the transmitter.
2. Insert and tighten #6 gauge wire (supplied) into the transmitter terminal ground lug.
3. Connect other end of wire to a verified building/earth ground source.

Complete Final Installation and Mounting Requirements

1. Weatherproof the antenna connection using gel wrap kit supplied.
2. Secure the GPS cable and LMR 400 cable to building and mast.
3. Leave a drip loop where both cables enter the building to prevent water from entering the building.
4. Use UV resistant zip ties to secure the cables to the mast and building.

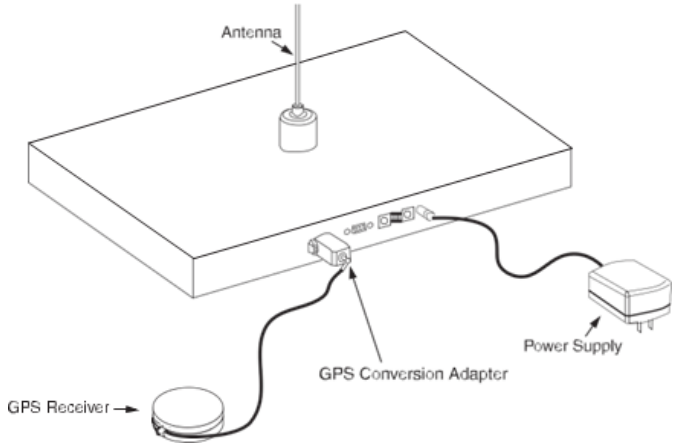
> **NOTE:** Do not zip tie the GPS cable to the LMR 400 cable. These two cables must be 2" (5.08cm) apart at all times, with the exception of the point where they enter into the building.

5. Verify all nuts and bolts in the mounting hardware are secure.
6. Caulk all exterior holes.
7. Secure and tie wrap all indoor cables.

Setup the Transmitter

1. Plug the included DB9/RJ45 GPS conversion adapter into the GPS socket located in the back of the Transmitter.

Figure 11: 14000 Transmitter - Internal Antenna



2. Plug the GPS cable into the GPS conversion adapter.
3. Set the switch preferences located on the back of the transmitter The transmitter continually checks the position of the switches. The switches select time zone, channel number, 12- or 24-hour display, and the observance of Daylight Saving Time.

Figure 12: 14000 Transmitter - Back View

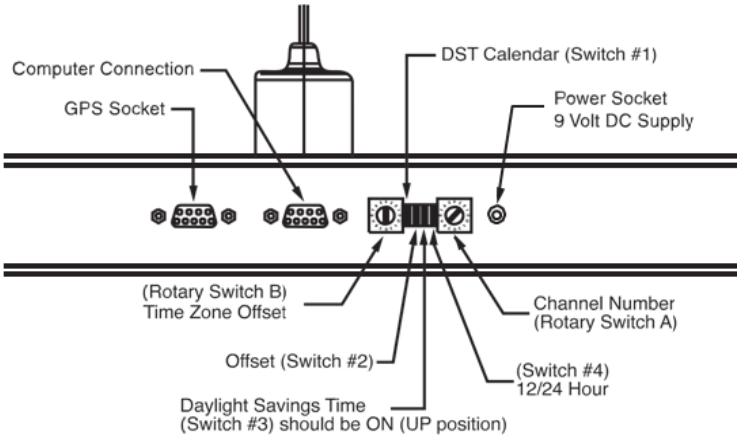


Table 3: 14000 Series Transmitter - Switch/Component Specifications

<table>
<tr><th>Switch/Component</th><th>Description</th></tr>
<tr><td>Rotary Switch A (channel selection)

Warning: Do Not adjust this switch. It is only to be set to the frequency specified on the FCC/IC application.</td><td>Factory preset to the FM frequency on which the transmitter will broadcast.

There are 16 available channels. The chart below explains which switch positions correspond to which channel numbers.

<table>
<tr><th>Switch No.</th><th>Channel No.</th><th>Switch No.</th><th>Channel No.</th></tr>
<tr><td>0</td><td>16</td><td>8</td><td>8</td></tr>
<tr><td>1</td><td>1</td><td>9</td><td>9</td></tr>
<tr><td>2</td><td>2</td><td>A</td><td>10</td></tr>
<tr><td>3</td><td>3</td><td>B</td><td>11</td></tr>
<tr><td>4</td><td>4</td><td>C</td><td>12</td></tr>
<tr><td>5</td><td>5</td><td>D</td><td>13</td></tr>
<tr><td>6</td><td>6</td><td>E</td><td>14</td></tr>
<tr><td>7</td><td>7</td><td>F</td><td>15</td></tr>
</table></td></tr>
<tr><td>Rotary Switch B</td><td>Sets the time zone. Use a small slotted screwdriver to adjust the rotary switch.

“4” for Atlantic Time Zone

“5” for Eastern Time Zone

“6” for Central Time Zone

“7” for Mountain Time Zone

“8” for Pacific Time Zone

“9” for Alaska Time Zone

“A” for Hawaii Time Zone</td></tr>
<tr><td>Switch #1</td><td>Sets the Daylight Saving Time Calendar.

Up to automatically change to the new Daylight Saving Time calendar in 2007.

Down to abide by the old schedule in 2007.</td></tr>
<tr><td>Switch #2</td><td>Sets the direction of UTC offset.

Up for U.S. and Canada

Down for Europe</td></tr>
</table>

Switch/Component	Description
Switch #3	Sets the automatic Daylight Saving Time adjustment. Up for automatic Daylight Saving Time changes Down to bypass Daylight Saving Time adjustments
Switch #4	Sets the clock display on the transmitter. Up for 12-hour display Down for 24-hour display

4. Plug the supplied 9 Volt 2.0 Amp DC power supply (transformer) into the transmitter.
5. Plug the power supply (transformer) into a 120 VAC outlet.

Verify System is Operational

The final step is to verify the system is operating and functional.

1. Verify a GPS signal has been received.
2. Verify the Time and Date are correct.
3. Verify the Channel Number is set correctly.

TRANSMITTER OPERATION

The following assumes that the transmitter has been properly set up as described in setup of the transmitter.

Basic Operation of the Transmitter

When power is first applied to the transmitter, the front display will light up and show important information.

- Red LED light will flash until the transmitter receives a valid time signal from the GPS Receiver.
- Display will initially show the time as 12:00:00 and will note the software version.
- Transmitter checks the position of the switches on the rear of the transmitter and stores their settings in memory.
- Transmitter then sends information to the GPS Receiver and waits for time information from the GPS Receiver.
- The GPS Communication indicator will appear when the transmitter is receiving a signal from the satellite through the GPS Receiver. If the symbol is not displayed, see Troubleshooting.

The time on the display will increment once each second until the GPS Receiver sends the transmitter a valid time. The GPS Receiver needs to "see" 3 satellites in the sky above before it will send a time signal to the transmitter. This may take up to 15 minutes for a GPS Receiver that has a 360° view of the sky. The length of time is dependent on the location, weather conditions, time of day, etc. In areas where the unit does not have a full view of the sky, due to wall or window installations, building "shadows", etc., this may take up to several hours.

NOTE: The transmitter does not transmit time data until it has received valid time information from the GPS Receiver.

Once the transmitter receives the GPS Receiver time signal, the transmitter sets its internal clock to that time and will display the correct time and date. The transmitter then begins transmission of its internal time once every second. The transmission signal is a maximum one-watt FM signal at approximately 72MHz. The transmitter continually monitors the GPS Receiver and the transmitter updates its internal clock with the time data it receives.

NOTE: If the transmitter does not receive a valid time data from the GPS Receiver for 48 hours, the red LED on the right side of the front panel will flash.

The number to the right side of the display is the channel number to which the transmitter will be transmitting the time signal.

WARNING: The channel number must be the same as the channel number specified on your FCC/IC license. If not, you must immediately adjust the channel to the number that corresponds to the FCC/IC license.

Daylight Saving Time

The transmitter is pre-programmed to automatically make adjustments for Daylight Saving Time.

- The letters "DT" (Daylight Saving Time) or "ST" (Standard Time) will be displayed when adjustment for Daylight Saving Time is active (switch #3 in the up position).
- If neither "DT" nor "ST" is displayed, then switch #3 is in the down position and the transmitter will not adjust for Daylight Saving Time.
- The adjustment to Daylight Saving Time and back to Standard Time take place 2:01 AM on the day of change.

NOTE: The GPS signal does not encode information about Daylight Saving Time. In the spring when the transmitter changes to Daylight Saving Time, the system clocks will adjust by advancing faster than their normal speed to make the adjustment and then return to normal operation. In the fall when the transmitter returns to Standard Time, the system clocks will make the time adjustment and then return to normal operation.

Time Zone

The time zone of your location is not shown on the display. However, when the transmitter has received a valid time from the GPS Receiver, the correct time zone can be checked by verifying that the correct hour is displayed. The transmitter can be set for all 24 time zones around the world and 1/2-hour time zones.

12-Hour or 24-Hour Time

The 12/24-Hour option only affects the transmitter LCD display. If AM or PM is on the display, then the 12-hour option is selected with switch #4. If neither AM nor PM is on the display, then the 24-hour option is selected.

- Analog System Clocks are 12-hour clocks.
- ED Digital System Clocks have a selectable jumper option to display either 12-hour or 24-hour time regardless of the transmitter 12/24 option setting.

Status of GPS Receiver Communication

The status of the GPS Receiver is indicated by the GPS Communication indicator.

- When the "Y"-like symbol is displayed, the GPS Receiver is connected to the transmitter and there is proper communication between the GPS Receiver and the transmitter.
- When the transmitter is receiving valid time data from the GPS Receiver, the three parentheses will sequence in a motion pattern. If these symbols are not displayed, see Troubleshooting.

Power Failure

The system has a fail-safe design. If the failure of a system component or power loss to a component occurs, all downstream components continue normal operations using their own internal time base. If after a specified period, communication has not been restored, a visual that indicates a loss of communication appears and remains until communication is restored.

EXAMPLE: Red flashing LED on the transmitter; flashing colons on LED digital clocks; double stepping of second hand on analog clocks.

TROUBLESHOOTING

Transmitter Problems

The first step in troubleshooting the Transmitter is to reset the Receiver. If the Transmitter fails to receive a GPS signal and is set to time within 15 minutes, please reset the Transmitter.

Note: The transmitter does not have an ON/OFF switch. To reset the Receiver, unplug the power supply and then plug the unit back in.

Power glitches, line spikes, power interruptions, static discharge or other voltage fluctuations can cause loss of communication with the GPS Receiver if the disruption occurs during the initial setup communication between the transmitter and the GPS.

Note: The time of day, view of the sky, weather, solar flares and local interference also influence signal reception and can cause temporary loss of the GPS signal. If reception problems persist, see Signal Reception Problems.

Display Does Not Light Up

If the display does not light up, check the power supply connection to the transmitter and to the 120 VAC outlets. Verify that the AC outlet has power. Also, verify that the correct power supply is used (9V, 2.0A). If this does not correct the problem, either the power supply or the transmitter is defective. Call Primex Technical Support.

Display Lights Up, but is Blank or Very Faint

Call Primex Wireless Technical Support. The transmitter may be required to be replaced.

Signal Reception Problems

1. Verify that the GPS Receiver is properly connected to the Transmitter.
2. Verify that the GPS Receiver is properly mounted on a non-Low-E glass window or on a rooftop or pole outside with a clear view of the sky.
3. Check to assure that the GPS Communication indicator is showing on the display (looks like a "Y" with a line over it). If this symbol is displayed, then the Transmitter is communicating with the GPS Receiver.
4. If the GPS Communication indicator is not being displayed, then the transmitter, GPS Receiver, or the connection between transmitter and GPS Receiver is defective. Check the GPS cable connections.

> **NOTE:** The use of unshielded or standard shielded cables to extend the distance between the GPS Receiver and the transmitter beyond 50 feet can cause this failure mode. A special shielded cable with low resistance on the voltage supply line is required for distances over 50 feet. The maximum distance using the special cable is 200 feet. If cable connections are good, replace the GPS Receiver.

5. If the GPS Communication indicator is displayed but the parentheses (((are not flashing, then the problem is with the GPS Receiver or with its signal reception.
6. Check to make sure that the GPS Receiver has a clear view of the sky and that its view is not obstructed.

> **NOTE:** Double pane Low-E glass windows are coated with a transparent metal layer that reflects infrared heat rays; this will also reflect the GPS signal. The GPS Receiver will not receive the signal through Low-E windows.

Local interference can affect GPS reception. Try moving the location of the GPS receiver to improve reception. Weather conditions, solar flares, time of day, and exact satellite position may also effect signal reception; however, these conditions are normally of a short duration.

NOTE: When certain types of electronic light ballasts become defective they may radiate broadband noise, which can interfere with wireless devices. While interference issues are unlikely with the Primex Wireless Clock System, high levels of noise present in the 72-76MHz range could potentially cause clocks which are located far from the transmitter and also within the close proximity of these ballasts to not receive a signal. Very limited instances have occurred in the past, which has only been found to happen when ballasts become defective.

Displayed Time/Date is Incorrect

If the minutes and seconds are correct, but the hours are off or the day is off, then switches #2, #3, or Rotary Switch B are in the wrong position. Correct the switch settings.

Other than for the above reason, or the loss of the GPS signal, the transmitter, whose time is controlled by a GPS signal, should never display the wrong time or date. If such an event occurs, please contact Primex Wireless Technical Support.

Extremely Weak Transmitter Power (About 100 Feet or Less)

1. Unplug the transmitter and ground yourself to eliminate static electricity.
2. Check to make sure that the antenna is not cross-threaded. The base of the antenna must be flat on the Transmitter case.
3. Check to make sure that the antenna rod is secure in the antenna base (hand tighten only).
4. Check to make sure that the base of the antenna is tightly mounted on the Transmitter case.
5. Check to make sure that the antenna is not touching anything.
6. Plug in the transmitter. If the transmitter power is still extremely weak, the output stage of the transmitter may have failed. Contact Primex Wireless Technical Support.

Weak Signal (Limited Coverage Area)

The coverage area is determined by many factors. One of the primary factors is the transmitted signal compared to the background interference. For the clocks to receive a clear signal from the transmitter, the signal must be several times stronger than the background interference. Therefore, transmitters located in areas with generally higher background interference will have reduced coverage. If background interference is causing a problem, please contact Primex Wireless Technical Support.

Red LED is Flashing

The Red LED flashes when the unit has not received an updated time signal for 48 hours. It will also flash during initial setup.

1. Check the GPS Receiver and its cable for proper connection to the transmitter and possible damage to the cable. Check the mounting of the GPS Receiver to ensure that the mounting did not slip or change and that it has an unobstructed view of the sky.
2. Check the display panel for the GPS Communication indicator. If the symbol is there, re-check the location of the GPS Receiver and its view of the sky and resolve any obstructions. Then disconnect power from the transmitter, wait five seconds and reconnect power to the transmitter.
3. Check the display panel for the GPS Communication indicator. If the symbol is not there, disconnect power from the transmitter, disconnect the GPS Receiver from the transmitter, and check the GPS cable and connections. Then reconnect the GPS Receiver to the transmitter and reconnect power to the transmitter. If the GPS Communication symbol still does not appear in the display, replace the GPS Receiver.

TRANSMITTER BROADCAST - SYSTEM DEVICE INSTALLATION CONSIDERATIONS

The transmitter broadcasts a signal from 39 minutes after the hour to 6 minutes after the hour (except through 11:39pm- 12:06am). After this time, the transmitter output will go into standby and the display will indicate SB.

> **NOTE:** In the event of a facility wide power outage the transmitter will broadcast for 8 hours upon the restoration of power. This will synchronize all products. In the event that the power to a transmitter is shut off and turned back on, the transmitter will broadcast continuously for 8 hours. Power cycling the transmitter can be used to set/reset products.

The following section summarizes how each product reacts to timed operation.

Manual Setting Battery Operated Clocks

These clocks can be identified as analog clocks with a grey set wheel located on the back side.

While using the timed transmit schedule, the battery operated clocks will update at 2, 6, and 10 am/pm.

If installing clocks after the initial 8 hour transmission, there are 2 options

1. Install clocks between 39 minutes past the hour and 6 minutes after the next hour. They will set right away.
2. Cycle power to the transmitter. It will then transmit for 8 hours and clocks will set immediately on power up.

   If the clock batteries expire and are replaced when the transmitter is not broadcasting, the clock will not reset until the transmitter is power cycled.

   If 7 days pass without the clock receiving a signal from the transmitter, it will begin double stepping (taking two steps every two seconds) to alert the user of a signal reception problem

Automatic Setting Battery Operated Clocks

These clocks can be identified as analog clocks that do not have grey set wheel

While using the timed transmit schedule, the battery operated clocks will update at 2, 6, and 10 am/pm.

If installing clocks after the initial 8 hour transmission, there are 2 options

1. Install clocks between 39 minutes past the hour and 6 minutes after the next hour. They will set right away.
2. Cycle power to the transmitter. It will then transmit for 8 hours and clocks will set immediately on power up.

   If the clock batteries expire and are replaced when the transmitter is not broadcasting, it will not reset until the transmitter is power cycled.

   If 4 days pass without the clock receiving a signal from the transmitter, it will begin five stepping (taking five steps every five seconds) to alert the user of a signal reception problem.

AC Powered Analog Clocks

While using the timed transmit schedule, the clocks will update at 2, 6, and 10 am/pm. If a signal is not received at a specific update time, the clock will continue to search for a signal until it receives one.

If installing clocks after the initial 8 hour transmission, there are 3 options

1. Install clocks between 39 minutes past the hour and 6 minutes after the next hour. They will set right away.
2. Install the clocks any time of the day. They will not set until 39 minutes after the hour.
3. Cycle power to the transmitter. It will then transmit for 8 hours and clocks will set immediately on power up.

   If 4 days pass without the clock receiving a signal from the transmitter, it will begin five stepping (taking five steps every five seconds) to alert the user of a signal reception problem.

Digital LED Clocks

While using the timed transmit schedule, the LED clocks will update at 39, 45, 55, and 05 minutes past the hour.

If installing clocks after the initial 8 hour transmission, there are 3 options

1. Install clocks between 39 minutes past the hour and 6 minutes after the next hour. They will set right away.
2. Install the clocks any time of the day. They will display dashes until they receive a signal from the transmitter 39 minutes after the hour.
3. Cycle power to the transmitter. It will then transmit for 8 hours and clocks will update immediately on power up.

   If the clock loses power when the transmitter is in standby and not broadcasting, it will show dashes until

   39 minutes after the hour.

   If an LED clock has been synchronized and has not received a signal from the transmitter in 72 hours, the colons will flash.

Satellite Transmitter - Receiver Switch (Repeater)

While using the timed transmit schedule, the receiver switch will update between 40 and 56 minutes past the hour. The actual update time varies depending on what channel number it is receiving a signal on.

If installing a receiver switch after the initial 8 hour transmission, there are 3 options

1. Install the receiver switch between 39 minutes past the hour and 6 minutes after the next hour. It will set right away.
2. Install the receiver switch at any time of the day, it will disable the output of the satellite transmitter and the green LED will remain solid until 39 minutes after the hour. At that time, the LED will begin flashing and the transmitter connected to it will begin broadcasting.
3. Cycle power to the transmitter. It will then transmit for 8 hours and the receiver switch will update immediately on power up.

   If a receiver switch loses power when the transmitter is not broadcasting, it will disable the output of the satellite transmitter and the green LED will remain solid until 39 minutes after the hour. At that time, the LED will begin flashing and the transmitter connected to it will begin broadcasting.

   If a receiver switch has been synchronized and did not receive a signal from the transmitter the previous hour, the green LED will go solid. If it has not received a signal in 48 hours the red LED on the transmitter it is connected to will begin to flash.

Wireless Tone Generator

While using the timed transmit schedule, the wireless tone generator will update between 39 and 6 minutes past the hour. The green LED on the wireless tone generator will flash during this time indicating that it is receiving a signal.

If installing a wireless tone generator after the initial 8 hour transmission, there are 2 options

1. Install the wireless tone generator between 39 minutes past the hour and 6 minutes after the next hour. It will update its time right away and begin updating its schedule information.
2. Cycle power to the transmitter. It will then transmit for 8 hours and the wireless tone generator will update both its time and schedule information immediately on power up.

   If the wireless tone generator loses power when the transmitter is not broadcasting, the LED will go solid until 39 minutes after the hour. At that time, the LED will begin flashing and the time and event schedule information will be updated.

   When a new event schedule is downloaded to a transmitter, it will broadcast continuously for 30 minutes to update the time and schedule information in the wireless tone generator.

SUPPORT

Technical Support

Prime Wireless Technical Support responds to specific questions about product features, system configuration, and troubleshooting. All support services will be delivered in accordance with your organization's support agreement and warranties.

Contact Technical Support

Before contacting Primex Wireless Technical Support, make sure you have satisfied the system requirements that are listed in your product documentation.

When you contact Technical Support, please have the following information available:

- Customer ID
- Problem description
- Device hardware information
- Error messages
- Troubleshooting performed before contacting Primex Wireless

Technical Support	
Telephone	(800) 404-8112
Email	techsupport@primexinc.com
Fax	(262) 248-0061
Hours	7:00 am to 7:00 pm CST | Monday through Friday
Web	www.primexwireless.com

WARRANTY

One Year Limited Warranty

Primex Corporation warrants this product to be free from defects in materials and workmanship for a standard of one year from the date of purchase. Primex will at its sole option, repair or replace any components that fail in normal use. Such repairs or replacements will be made at no charge to the customer for replacement parts. The customer will be responsible for any transportation costs. This warranty does not cover failures due to misuse, abuse, accidental or unauthorized alterations or repairs.

The warranties and remedies contained herein are exclusive and in lieu of all other warranties express or implied or statutory, including any liability arising under any warranty or merchantability or fitness for a particular purpose, implied, statutory or otherwise. In no event shall Primex be liable for any incidental, special, indirect or consequential damages, whether resulting from the use, misuse or inability to use this product or from defects in the product. Some states do not allow this exclusion or limitation of incidental or consequential damages so the above limitations or exclusion may not apply to you.

To obtain warranty service: If after following the instructions in the product guide, you are certain the product is defective, please contact Primex Wireless Technical Support to assist with troubleshooting the issue. If the issue cannot successfully be resolved and the product is under warranty, an RMA (Return Material Authorization) will be generated. The RMA form will be provided via email with detailed instructions for the return. All merchandise returned must be shipped to Primex Wireless, Attn: Returns Dept., N3211 County Road H, Lake Geneva, WI 53147.

Primex Wireless retains the exclusive right to repair or replace the unit at its sole discretion. All merchandise returned must be shipped to Primex Wireless, Attn: Returns Dept., N3211 County Road H, Lake Geneva, WI 53147. Primex Wireless retains the exclusive right to repair or replace the unit at its sole discretion. Such shall be your sole exclusive remedy for any breach of warranty.